PLASTIC FILM BAG WITH AN AIR CUSHION

Technical Field

[0001] The present invention relates to a plastic film bag, and more particularly to a plastic film bag with an air cushion formed of cells filled with air.

Background Art

[0002] Conventionally, electric appliances like personal computers have been packed with styrene foam used as a cushioning material, and there has been a problem that after unpacking, the cushioning material is left as a large volume of refuse. In order to solve this problem, the Japanese patent laid-open publication No. 9-124073 suggested a plastic film bag with a cushioning formed of a plurality of long cells. After putting an item in the bag, air is injected into the cells, so that the cells filled with air serves as a cushion. A flap with a pressure sensitive adhesive double coated tape thereon is extended from the opening of the bag, and the bag is sealed by folding back the flap and by bonding the flap to the surface of the bag via the adhesive double coated tape.

[0003] Thus, the pressure sensitive adhesive double coated tape is necessary to seal the plastic bag, and it takes trouble to bonding the flap to the surface of the bag. Also, because the cells are swelled with air and become round, the ratio of the adhering area to the surface of the bag becomes smaller. Thereby, there have been a problem that the adhering force may be weaker and that the flap may be peeled from the surface of the bag.

[0004] An object of the present invention is to provide a plastic film bag with an air cushion which can be sealed securely without using an adhesive.

Disclosure of Invention

[0005] In order to attain the object, a plastic film bag according to the present invention comprises a bag body composed of a front side and a back side made by folding a tubular material which has a plurality of plastic film long cells which are arranged and connected in parallel at substantially a center with respect to a direction of longer dimensions of the cells and by fusing the folded portion at both sides; a flap which is extended from an open end of the back side of the bag body and which comprises a plurality of cells which communicate with the cells formed in the bag body; and air injection means which is provided for the bag body to inject air into the cells of the bag body and the flap. When the cells of the bag body and the flap are filled with air after an item is contained in the bag body, the flap is pressed between the item in the bag body and the front side swollen with air.

[0006] An item is contained in the bag body of the plastic film bag according to the present invention, and thereafter, the cells are filled with air. Thereby, the inner dimensions of the bag body is reduced, and the item in the bag body is compressed. Simultaneously, the air in the cells serve as a cushion. When air is injected to the cells, the flap is pressed between the item in the bag body and the front side swollen with air. The pressure can be set so strong that the flap cannot be pulled out unless the cells are emptied of air.

[0007] Thus, in the plastic film bag according to the present invention, since strong air pressure is applied to the flap from the cells, any adhesives are no longer necessary to bond the flap to the bag body. Then, the bag once sealed cannot be put open unless the cells are emptied of air by, for example, making holes in the cells. Therefore, if the item packed in this plastic film bag is stolen during delivery of the item, the package is recognizable.

[0008] The packing bag with a cushion which has been described above as a prior art is characterized merely in that air filled in the cells serve as a cushion. In the prior art, there is no idea that an item is kept in the bag by a compressive force due to a reduction of an inner circumferential length of the bag body.

[0009] In the plastic film bag according to the present invention, preferably, when air is injected to the cells, a recess is formed in the inner surface of the front side of the bag body, and the swollen portion of the flap engages with the recess. Due to the engagement, the flap is securely prevented from coming out.

[0010] The air injection means may comprise check valves which are provided for the respective cells, an air injector which is provided for the bag body and an air passage for supplying air from the air injector to the check valves. In this structure, because each of the cells is provided with a check valve, even if air is leaked from one of the check valves, it will not influence the packing of the item and the fixing of the flap. In this case, the air injector is preferably located at an open end of the front side of the bag body so that the air injection can be carried out easily.

[0011] The air injection means may comprise a check valve which is

provided for the bag body and an air passage for supplying air from the check valve to the cells. Since the cells are not provided with check valves, this structure of the bag body is simple. The check valve is preferably located at an open end of the bag body so that the air injection can be carried out easily.

Brief Description of Drawings

[0012] Fig. 1A is a plan view of a plastic film bag according to a first embodiment of the present invention, and Fig. 1B is a sectional view taken along the line a-a in Fig. 1A.

Fig. 2A is a developed view of the plastic film bag shown in Fig. 1A, and Fig. 2B is a sectional view taken along the line b-b in Fig. 2A.

Fig. 3 is a sectional view of the plastic film bag shown in Fig. 1A keeping an item therein.

Figs. 4A and 4B are perspective views of the plastic film bag, showing a process of putting an item in the bag.

Figs. 5A and 5B show the reduction of the inner surface of the bag body by air injection.

Fig. 6A is a plan view of a plastic film bag according to a second embodiment of the present invention, and Fig. 6B is a sectional view taken along the line c-c in Fig. 6A.

Fig. 7A is a developed view of the plastic film bag shown in Fig. 6A, and Fig. 7B is a sectional view taken along the line d-d in Fig. 7A.

Fig. 8 is a sectional view of the plastic film bag keeping an item therein;

Fig. 9A is a plan view of a plastic film bag according to a third

embodiment of the present invention, and Fig. 9B is a sectional view take along the line e-e in Fig. 9A.

Fig. 10 is a developed view of the plastic film bag shown in Fig. 9A.

Figs. 11A and 11B are sectional views of the plastic film bag shown in Fig. 9A keeping an item therein.

Fig. 12A is a plan view of a plastic film bag according to a fourth embodiment of the present invention, and Fig. 12B is a sectional view taken along the line f-f in Fig. 12A.

Fig. 13 is a developed view of the plastic film bag shown in Fig. 12A.

Fig. 14 is a sectional view of the plastic film bag shown in Fig. 12A keeping an item therein.

Figs. 15A, 15B and 15C are perspective views which show a process of putting an item in a plastic film bag according to a fifth embodiment of the present invention.

Best Mode for Carrying Out the Invention

[0013] Plastic film bags with air cushions according to preferred embodiments of the present invention are described with reference to the accompanying drawings.

First Embodiment; See Figs. 1-4

[0014] Fig. 1A is a plan view of a plastic film bag 10 according to a first embodiment of the present invention, and Fig. 2A is a developed view of the plastic film bag 10. The bag 10, as Fig. 2A shows, is made of a plastic tubular material 11 composed of a front film and a back film. By forming fused portions 12a in the tubular material 11 such that the fused

portions 12a extend in the direction of the longer side of the bag 10, ten long cells 12 which are arranged in parallel in the direction of the shorter side of the bag 10 are formed. In each of the cells 12, the front film and the back film are fused together at portions 12b and 12c. Fig. 2B shows a state where the respective cells 12 are filled and swollen with air.

[0015] The tubular material 11 is folded substantially in the middle of the longer dimensions of the cells 12, and as Figs. 1A and 1B show, the folded portions are fused together at both sides 16. Thus, a bag body 14 comprising a front side 17a, a back side 17b and an opening 18 is formed.

[0016] A flap 20 is provided to extend from the opening 18 of the back side 17b of the bag body 14. This flap 20 is made of the same plastic film of the cells 12 and is formed integrally with the cells 12. The fused portions 12a extend to the flap 12, so that the flap 12 has cells 21 which communicate with the respective cells 12 of the bag body 14. At the borders between the cells 12 and the cells 21, the front film and the back film are fused to form fused portions 12d.

[0017] Further, air injection means for injecting air into the cells 12 and 21 is provided for the bag body 14. The air injection means comprises check valves 31 provided at one end along the array of the cells 12 (near the open end of the front side 17a of the bag body 14), an air injector 32 provided at the end of the bag body 14 (at the open end of the front side 17a of the bag body 14) and an air passage 33 for supplying air from the air injector 32 to the check valves 31.

[0018] The check valves 31 are of a known structure wherein two plastic films are stacked (for example, see Japanese utility model laid-open publication No. 1-164142, Japanese patent laid-open publication No.

7-10159). The check valves 31 of this type permit air flows into the cells 12 while preventing air backward flows from the cells 12.

[0019] The air injector 32 is composed of two plastic films stacked together and is inserted and fused between the front film and the back film of the bag body 14. A nozzle (not shown) is inserted in the air injector 32, and compressed air is injected.

[0020] The air passage 33 is formed to extend through all the cells at an end (at an end of the front side of the bag body 14) and communicate with all the cells 12. The compressed air injected through the air injector 32 is supplied to the respective check valves 31 and then to the respective cells 12 via the air passage, and the compressed air is further supplied to the cells 21 of the flap 20. Referring to Fig. 2A, the entire circumference of the tubular material 11 is fused, and the tubular material 11 is airtight except that the air passage 33 communicates with the outside only via the air injector 32.

[0021] As Figs. 3, 4A and 4B show, an item A is contained in the bag 10 of the above-described structure. First, as Fig. 4A shows, the item A is inserted in the bag body 14 through the opening 18. Next, as Fig. 4B shows, the flap 20 is inserted between the item A and the front side 17a. In this state, when compressed air is injected from a nozzle (not shown) through the air injector 32, the cells 12 are swollen and become round. Simultaneously, the cells 21 of the flap 20 are swollen with air and become round. Thereby, the flap 20 is stuck between the item A in the bag body 14 and the front side 17a swollen with air.

[0022] Thus, the item A is compressed in the bag body 14 because the inner circumferential length of the bag body 14 reduces due to the swell of

the cells 12. At this time, a strong compressive force is applied also to the flap 20 from the front side 17a, and the bag body 14 can be sealed securely. In this state, it is very difficult to pull the flap 20 from the bag body 14 by hand.

[0023] When opening the bag 10, holes are made in some of the cells 12 to ease the compressive force of the bag body 14, and the flap 20 is pulled out. In order to facilitate the opening of the bag 10, air holes may be previously made in the cells 12. In this case, these holes are sealed by an adhesive tape, and when opening the bag 10, the adhesive tape is detached.

Compressive Force of Bag Body; See Fig. 5

[0024] Now, the principle of applying a strong compressive force to the flap 20 is described referring to specific values. Fig. 5A is a sectional view of the bag body 14 with the cells 12 not filled with air, and Fig. 5B is a sectional view of the bag body 14 with the cells 12 filled with air.

[0025] For example, as shown by Fig. 5A, the width of the cells 12 is 30mm, the width of the fused portions 12a is 2mm, and the number of cells 12 is 16. In this case, before air injection, the circumferential length of the bag body 14 is $(30+2)\times 16=512$mm.

[0026] When all the cells 12 are filled with air, each of the cells 12, which was 30mm wide, becomes circular with a circumference of 60mm. A circle with a circumference of 60mm has a diameter of 19.1mm. Therefore, when each of the cells 12 is filled with air and turns into a circle, the circumferential length of the bag body 14 becomes $(19.1+2)\times 16=337.6$mm. Thus, the circumferential length of the bag body 14 is reduced at approximately 34%. Because of this reduction, the item A

and the flap 20 are compressed. The circumferential length calculated above is a length of a line passing through the respective centers of the cells 12, and actually, the compressive force is applied to the points which are 9.55mm (the radius of the circles of the cells 12) inward from the centers of the cells 12.

[0027] In this way, the item A is compressed in the bag body 14 because of the difference in circumferential length between before the air injection and after the air injection. Therefore, if the item A is thin or small, the item A is surely kept in the bag body 14, and also the flap 20 is prevented from coming out.

[0028] Further, in the first embodiment, on the front side 17a, near the open side 18, vertical fused portions 12c are formed. As Fig. 3 shows, when an item is put into the bag body 14 and the flap 20 is folded back between the item and the front side 17a, the tip of the flap 20 comes to the vertical fused portions 12c. The cells 12 are not swollen so much at the fused portions 12c, and a recess 13 is made at the fused portions 12c. Then, the swollen portion 22 of the flap 20 comes into engagement with the recess 13. In this way, the flap 20 is fastened to the front side 17 due to the engagement between the swollen portion 22 and the recess 13, and the flap 20 is securely prevented from coming out from the inside of the bag body 14.

Second Embodiment; See Figs. 6 through 8

[0029] A plastic film bag according to the second embodiment is basically of the same structure as the plastic film bag according to the first embodiment. In Figs. 6A and 6B through 8, the same members and parts are provided with the same reference numerals as those in Figs. 1A

and 1B through 3. In the following description of the second embodiment, the point which is different from the first embodiment is described. Fig. 7B is a developed view of the bag body 14 of the plastic film bag according to the second embodiment in a state where the cells 12 and 21 are filled with air.

[0030] The feature of the second embodiment which is different from the first embodiment is that the air injection means comprises a check valve 35 which is provided on an end (the open end 18 of the front side 17a) of the bag body 14 and an air passage 36 which supplies air from the check valve 35 to the cells 12. The check valve 35 is of a well-known type which is used for air injection into bags of this type, and a detailed description thereof is omitted.

[0031] In the plastic film bag 10 according to the second embodiment, the cells 12 are not provided with check valves 31, and the plastic film bag 10 according to the second embodiment is easy to produce. Also, by making a hole in only one cell 12, air can be ejected from all the cells 12 and 21, and thereby, this bag 10 can be put open. Air ejection from the cells 12 and 21 can be performed also by inserting a straw or a wire in the check valve 35, and therefore, the bag 10 can be used repeatedly. The way of putting an item A in the bag 10 and the action of compressing the flap 20 are the same as those described in connection with the first embodiment.

Third Embodiment; See Figs. 9 through 11

[0032] A plastic film bag according to the third embodiment is basically of the same structure as the plastic film bag according to the first embodiment, and like the plastic film bag according to the second

embodiment, this plastic film bag according to the third embodiment has one check valve 35. In Figs. 9A and 9B through 11A and 11B, the same members and parts are provided with the same reference numerals as those in Figs. 1A and 1B through 3 and Figs. 6A and 6B through 8. In the following description of the third embodiment, only the points which are different from the first and second embodiments are described. Fig. 9B is a sectional view of the bag body 14 of the plastic film bag according to the third embodiment in a state where the cells 12 and 21 are filled with air.

[0033] The plastic film bag according to the third embodiment is used to contain a thin item B as shown in Fig. 11A or to contain a small item B' as shown in Fig. 11B. The features of the third embodiment which are different from the first and second embodiments are in the flap 20. According to the third embodiment, the flap 20 is so long that its tip can reach the bottom of the bag 10. Also, the cells 21 made in the flap 20 are wide (the pitch of the fused portions 21a in the third embodiment is double the pitch of the fused portions 21a in the first and second embodiments), and by air injection to the cells 21, the cells 21 are swollen to have a larger diameter than the cells 21 in the first and second embodiments.

[0034] In the third embodiment, after air injection, the flap 20 are swollen largely and is stuck between the item B and the front side 17a. Therefore, there is no fear that the flap 20 may come out. Further, in order to secure the engagement of the flap 20 with the front side 17a, in each of the cells 12, three fused portions 12e are formed instead of the vertical fused portion 12c.

Fourth Embodiment; See Figs. 12 through 14

[0035] A plastic film bag according to the fourth embodiment is, like the plastic film bag according to the third embodiment, used to contain a thin item B or a small item B'. In Figs. 12A and 12B through 14, the same members and parts are provided with the same reference numerals as those in Figs. 9A and 9B through 11A and 11B. In the following description of the fourth embodiment, the point which is different from the third embodiment is described. Fig. 12B is a sectional view of the bag body 14 of the plastic film bag according to the fourth embodiment in a state where the cells 12 and 21 are filled with air.

[0036] In the fourth embodiment, a horizontal fused portions 21b are made in the flap 20, so that wide cells 21 are formed. This is based on the same idea as the third embodiment, and by air injection, the cells 21 are swollen to have a larger diameter.

Fifth Embodiment; See Fig. 15

[0037] A plastic film bag according to the fifth embodiment is basically of the same structure as the plastic film bag according to the first embodiment. The difference from the first embodiment is that the flap 20 is long. According to the fifth embodiment, first, an item C is put on the flap 20 (see Fig. 15A), and the item C is wrapped in the flap 20 (see Fig. 15B). Then, the item C wrapped in the flap 20 is put in the bag body 14(see Fig. 15C). Thereafter, the cells 12 and 21 are filled with air. As in the first through fourth embodiments, after the air injection to the cells 12 and 21, the flap 20 is compressed in the bag body 14.

Other Embodiments

[0038] Although the preferred embodiments of the present invention

have been described, it is to be noted that various changes and modifications are possible to those who are skilled in the art. Such changes and modifications are to be understood as being within the scope of the present invention.

Industrial Applicability

[0039] Plastic film bags according to the present invention are suited to be used as packages for items to be protected from shocks, such as electric appliances like personal computers, electronic components, fragile items, etc., and especially suited to substitute for styrene foam which has been conventionally used as a cushioning material.